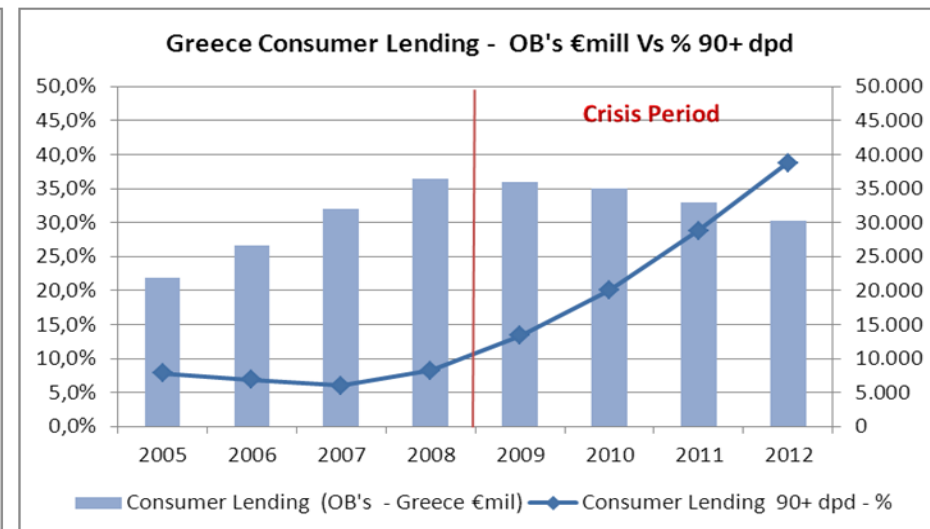
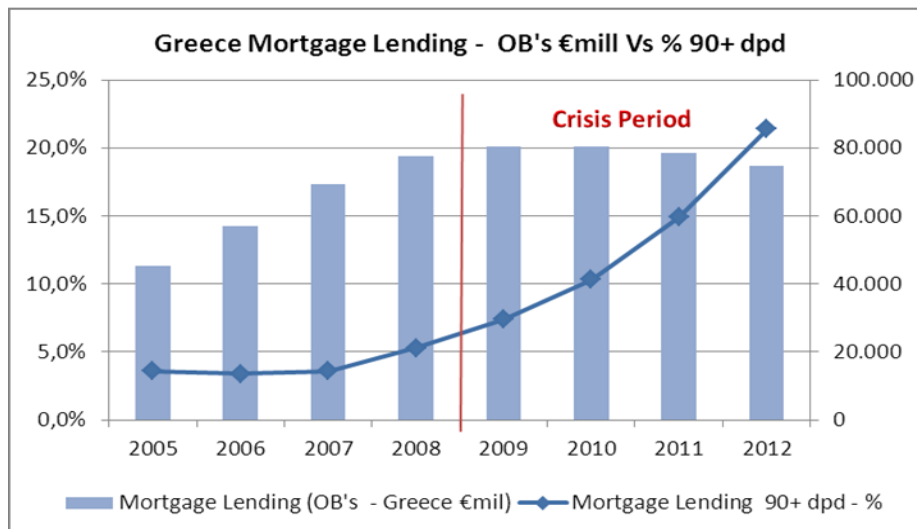
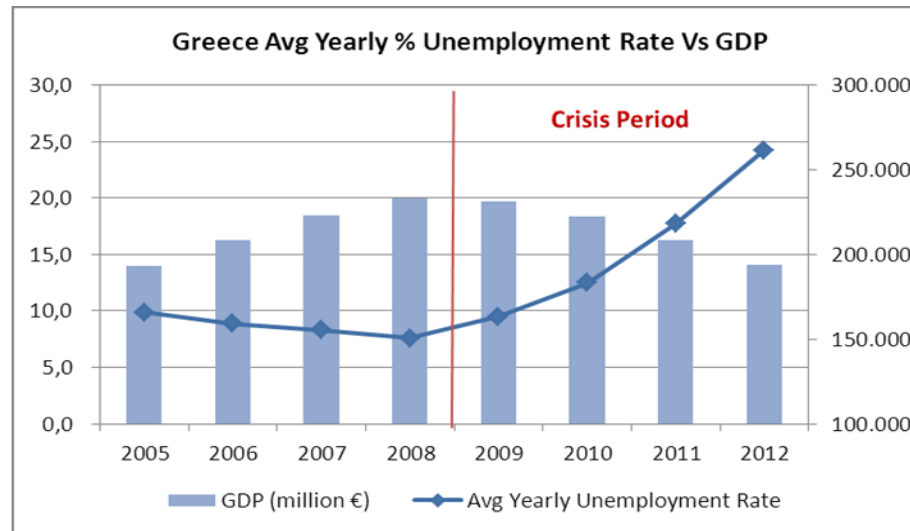

Credit Scoring Reshape because of and thanks to **the Financial Crisis**

Zoom – Focus – Synthesis

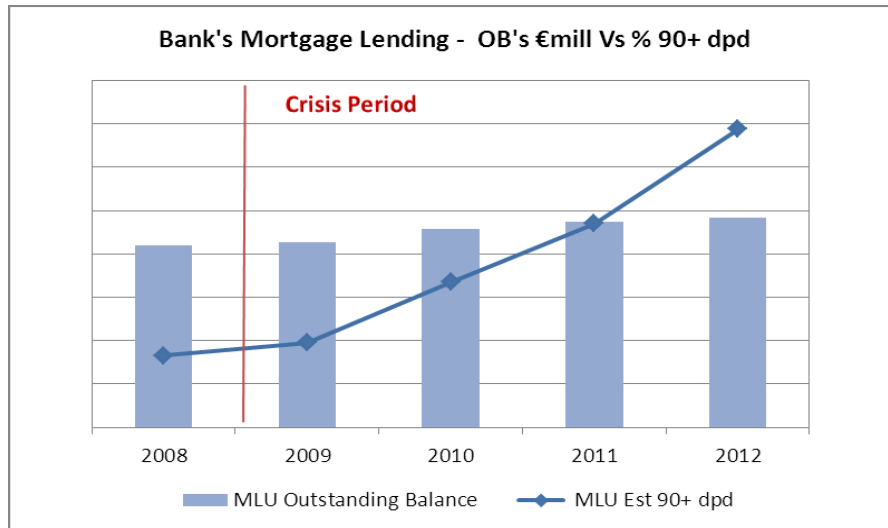
Christos Glimidakis, Fotis Tsiamas, Maria Bakogeorgou

July 2013

Macroeconomic Indicators of Greece

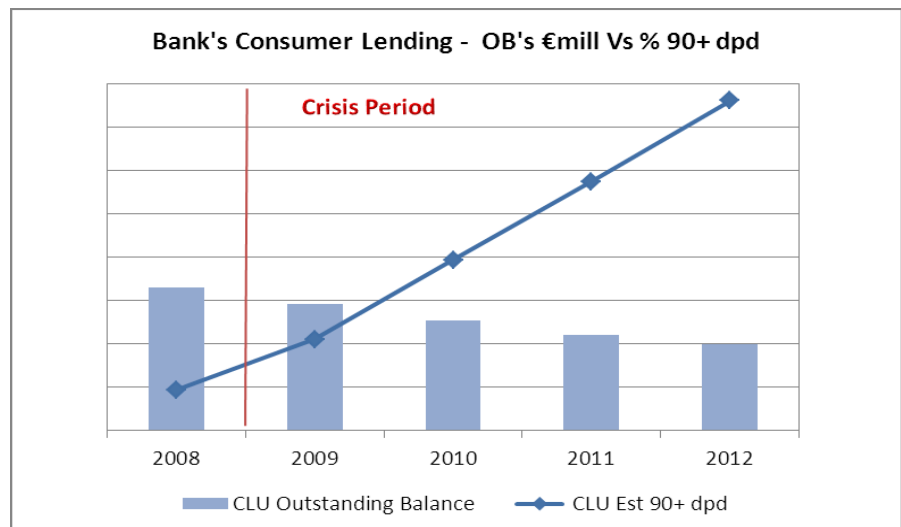


Financial Indicators of the Bank



From 2009 and onwards (Crisis Period) the 90+ dpd for the Mortgage Portfolio increased to relatively high levels. The 90+ dpd for the year 2012 was at a considerable higher rate than 2008, though quite less than the average Greek Market.

The major hit from the crisis was at the Consumer lending portfolio. Again, from 2009 and onwards (Crisis Period) the 90+ dpd for the Consumer Portfolio had reached high levels. The 90+ dpd for the year 2012 was at a significant higher rate than 2008 and at similar rates of the whole Greek Market.



Information- Before Crisis Vs. After Crisis

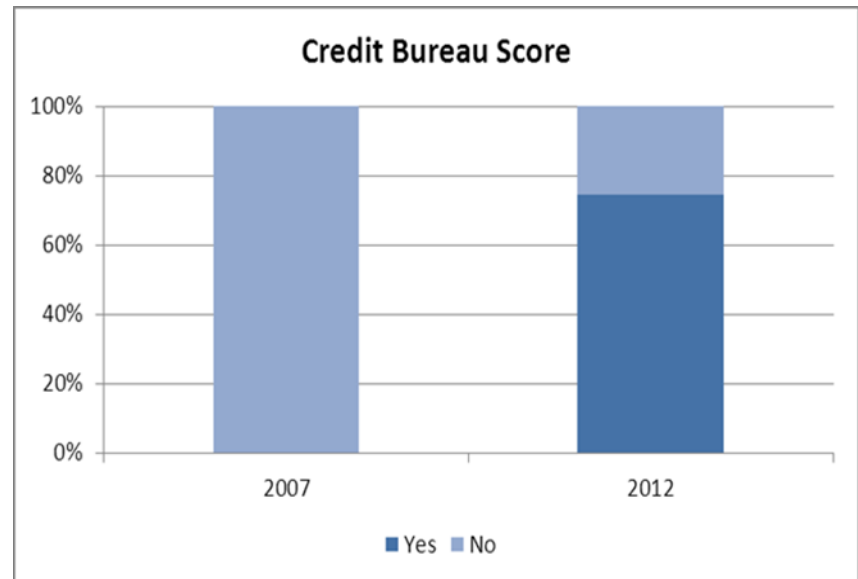
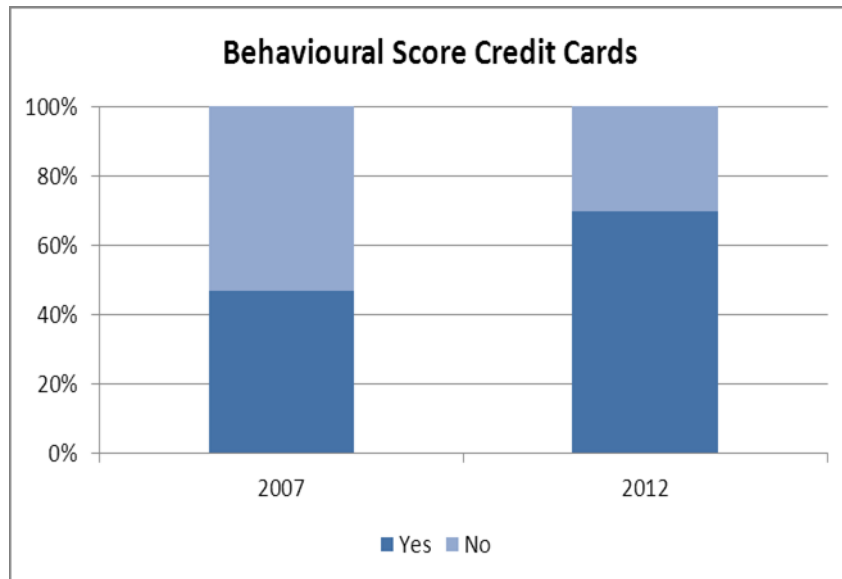
Before the crisis:

- The market was at infant stage and most banks main objective was increasing volumes
- The Credit Policy took into consideration only One Dimension information
- No combinations between Existing Score Models (Application & Behavioral) with Policy rules
- Limited information based on competitors

After the crisis:

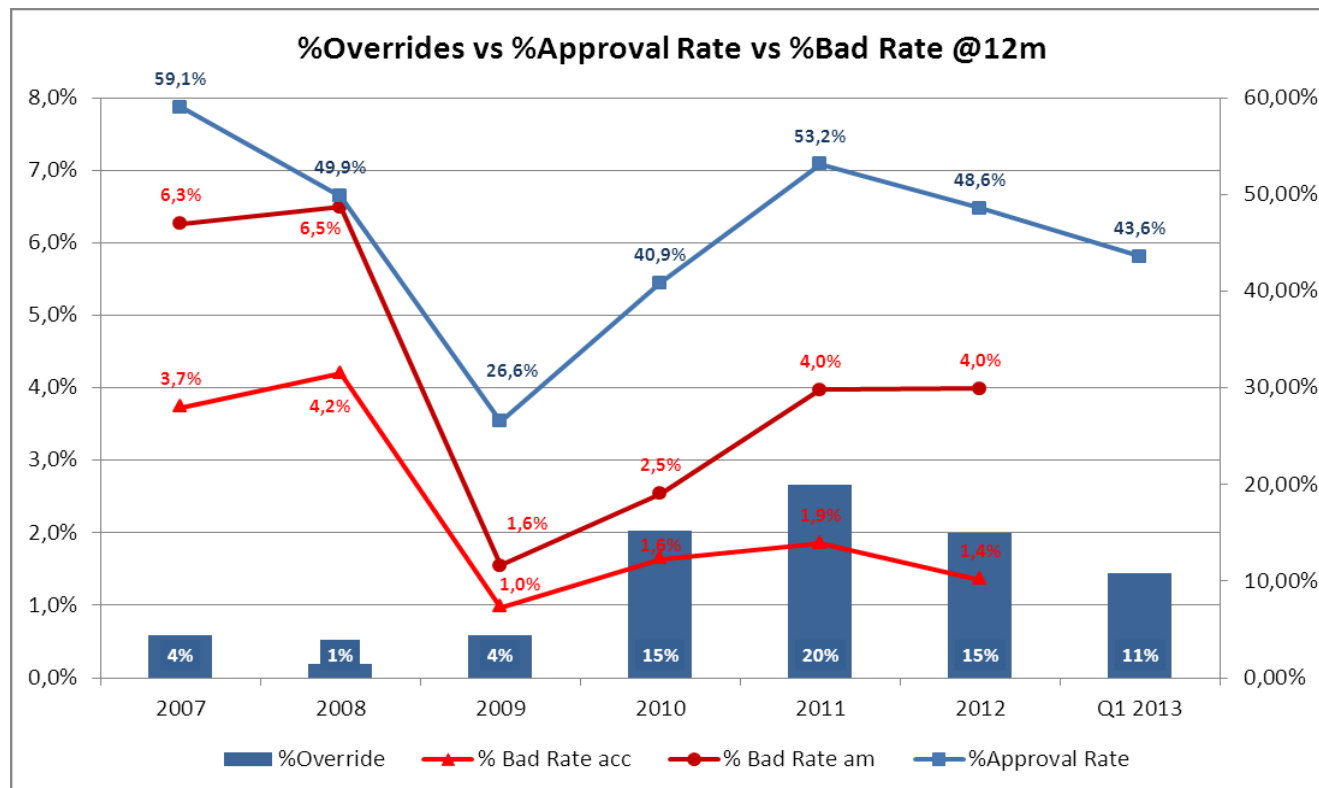
- Mature Portfolio
- Availability of Information regarding Bureau Score (2010 & onwards)
- Drill down analysis in areas that allowed advanced analytics to take a leading role

Examples Before Vs. After Crisis regarding information in the portfolio



Bank's Responsiveness towards the Crisis

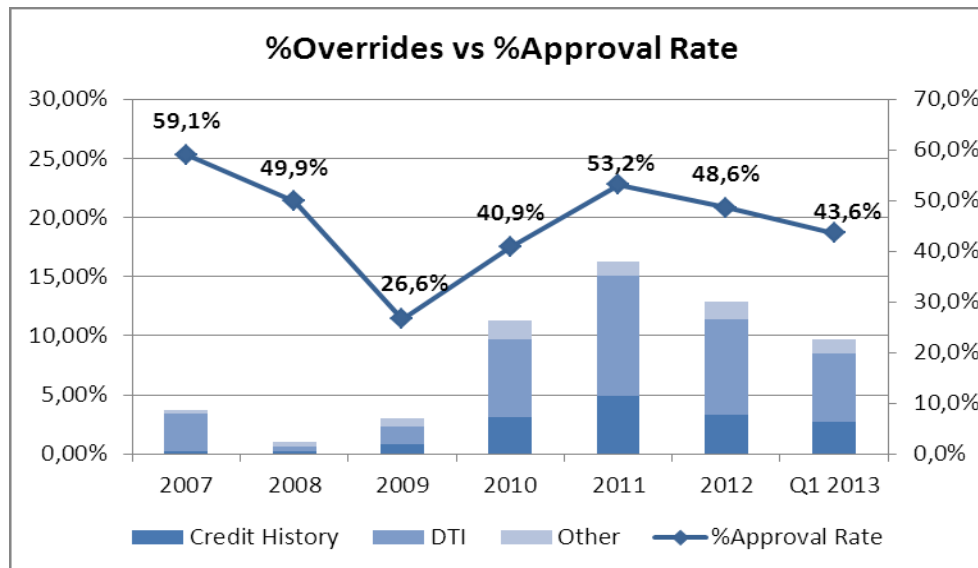
It was apparent that the Bank turned towards the judgmental process (Human Underwriting). From 4% before the crisis 2007 the judgmental contribution to the Total %Approval Rate increased to 20%. This was technically enlarged because the bank tightened all policy rules and subsequently assigned to the Credit officers the task of balancing positive and negative characteristics of the applications.



Zooming in the Bank's Decision

Analyzing the data it was quite obvious that the most important override reasons from the judgmental process were categorized into 3 main groups:

- **Credit History** (Behavioral Scores, Bureau Scores, Buckets of the Bank, Buckets of Competitors etc.)
- **Debt to Income** (Balances, Exposures, Limits, Income etc.)
- **Demographics & Other** (Customer Characteristics, Product etc.)



The increase of the human intervention led to important fluctuations in regards to the handling of applications with a similar profile.

This was due mainly to the psychological factor which played a crucial role since the country was in turmoil.

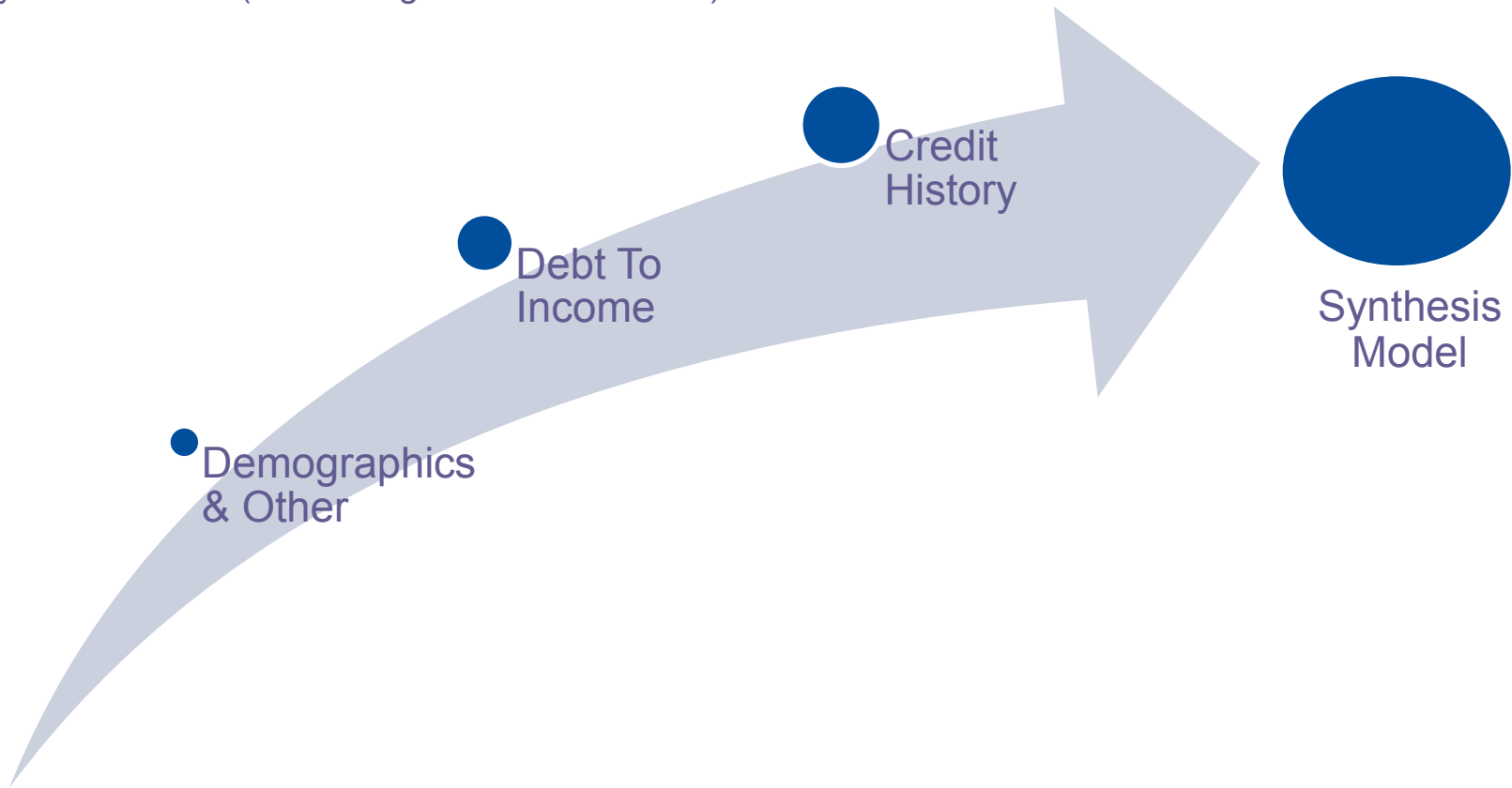
Advanced Analytics- Credit Scoring to the Rescue

3 Independent Models founded on the specific reason of Rejection

- Credit History Model- based on the Behavior of the Applicant
- Debt to Income Model- based on Financial Situation of the Applicant
- Demographics & Other Model- based on Demographics & Product Related Information

1 Dependent Model

- Synthesis Model (Combining all 3 models into 1)



Credit History Related Variables

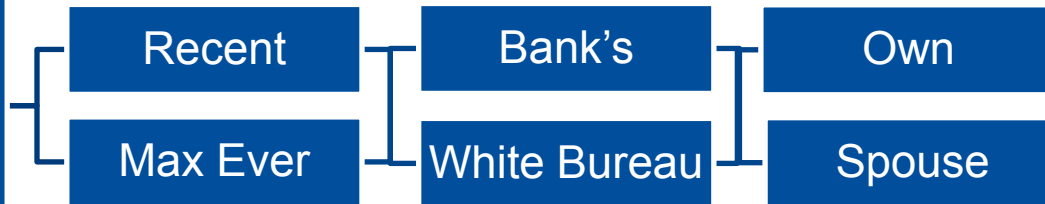
Bureau Scores



Behavioral Scores



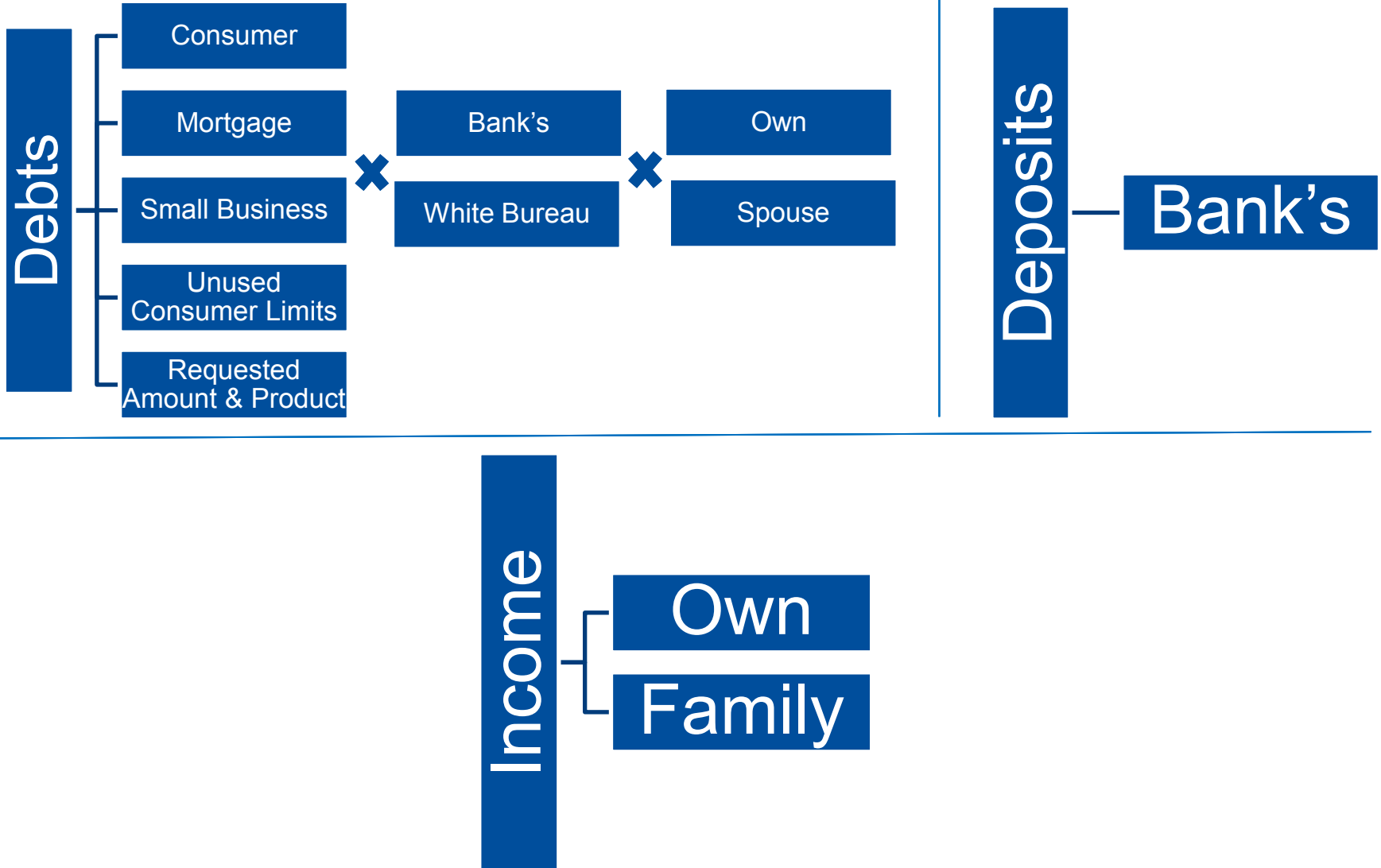
Delinquencies



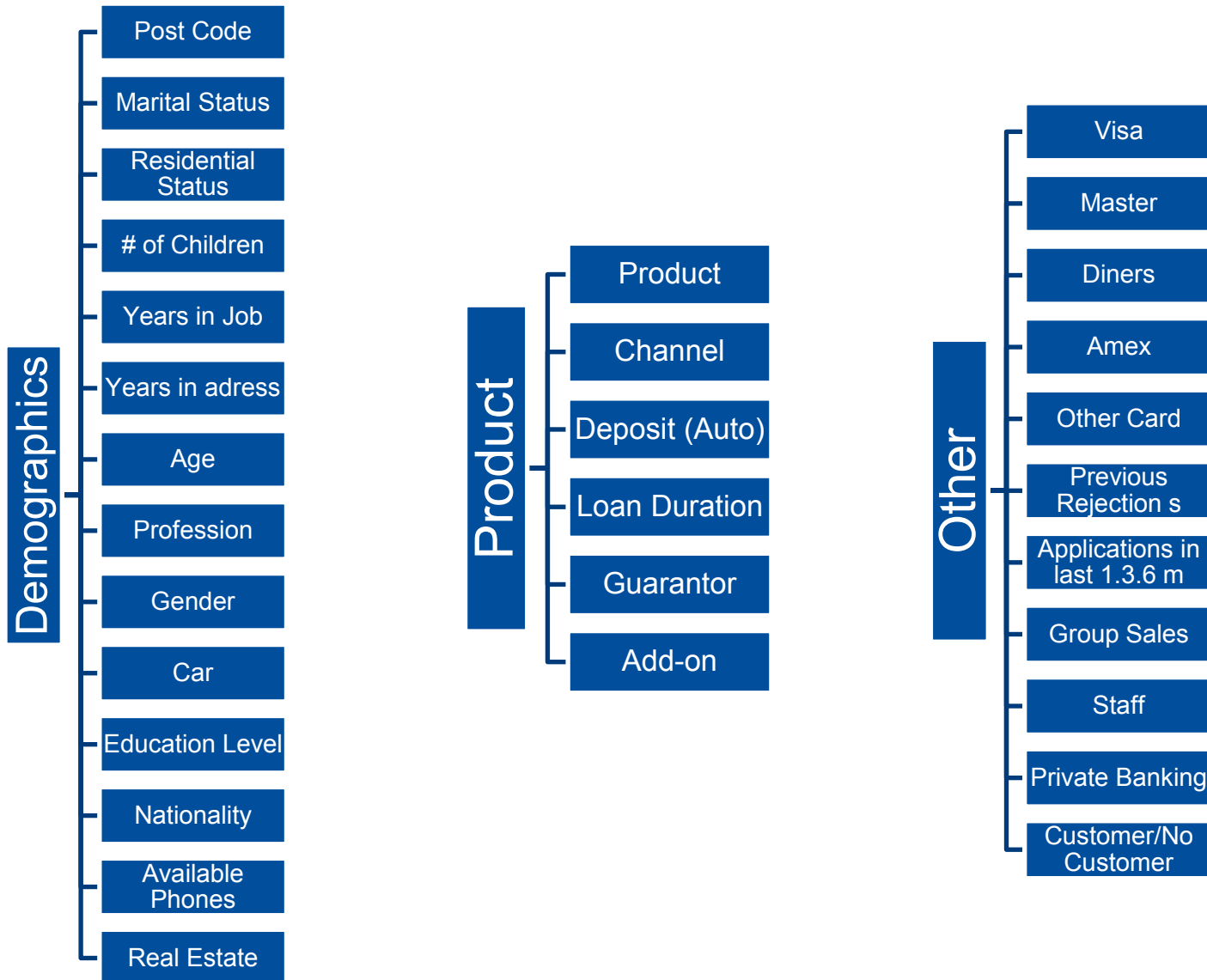
Members Since



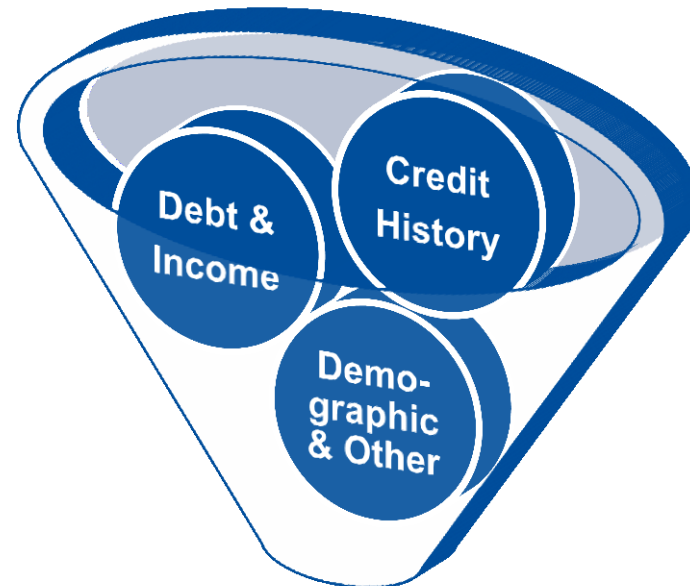
DTI Related Variables



Demographics & Other Related Variables

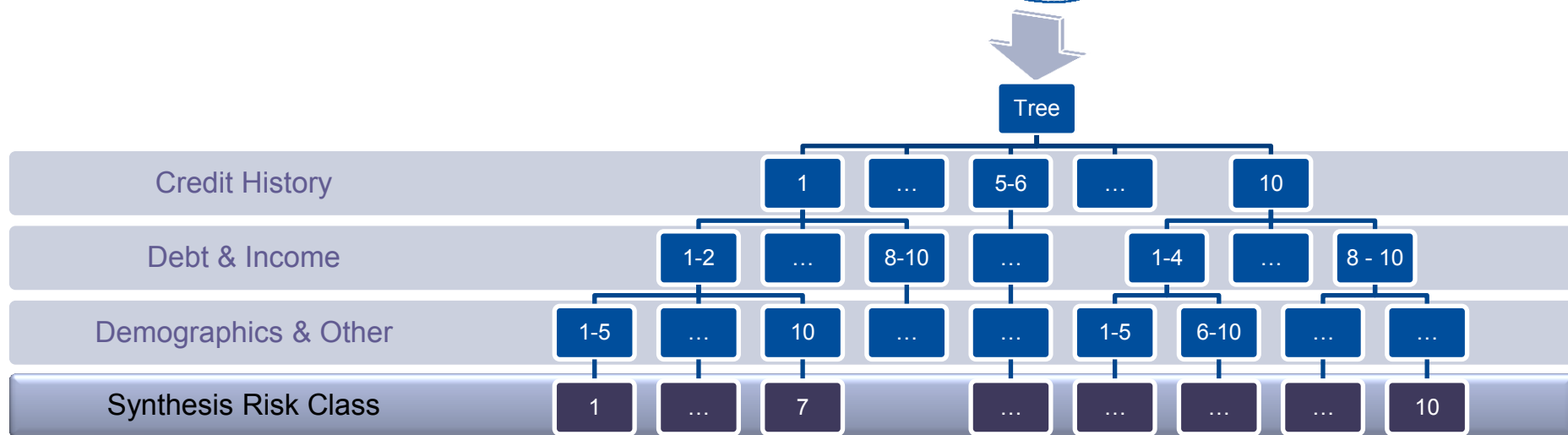


Synthesis: Combine 3 Models into a Single one

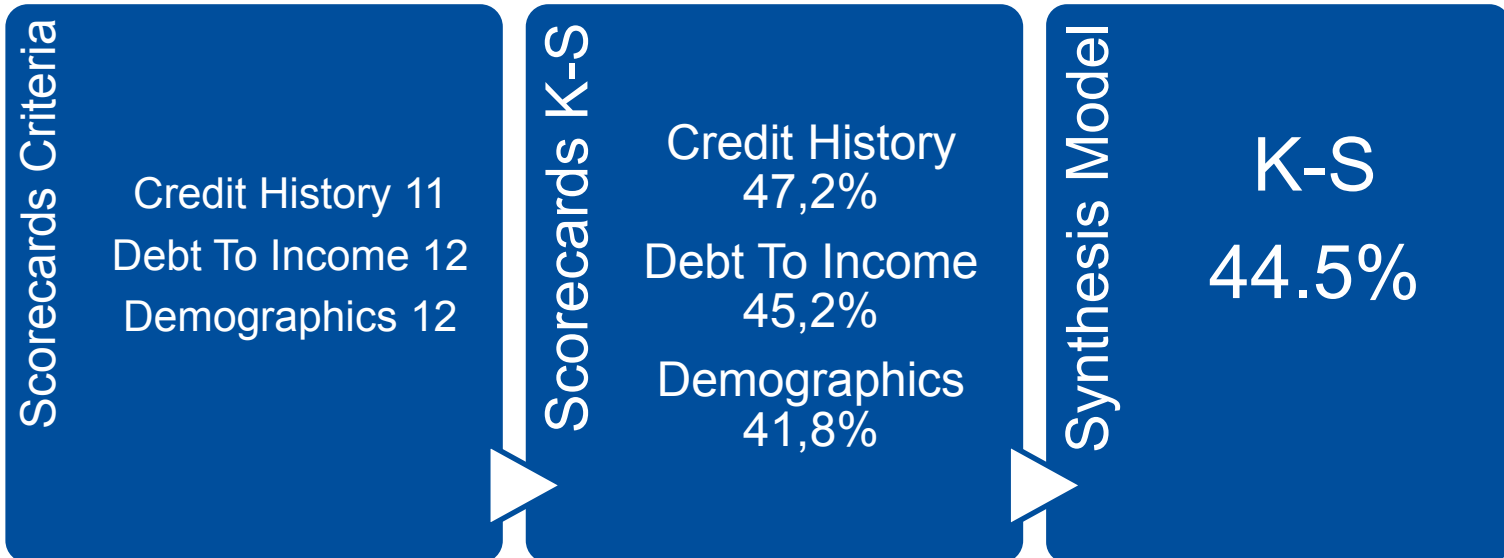
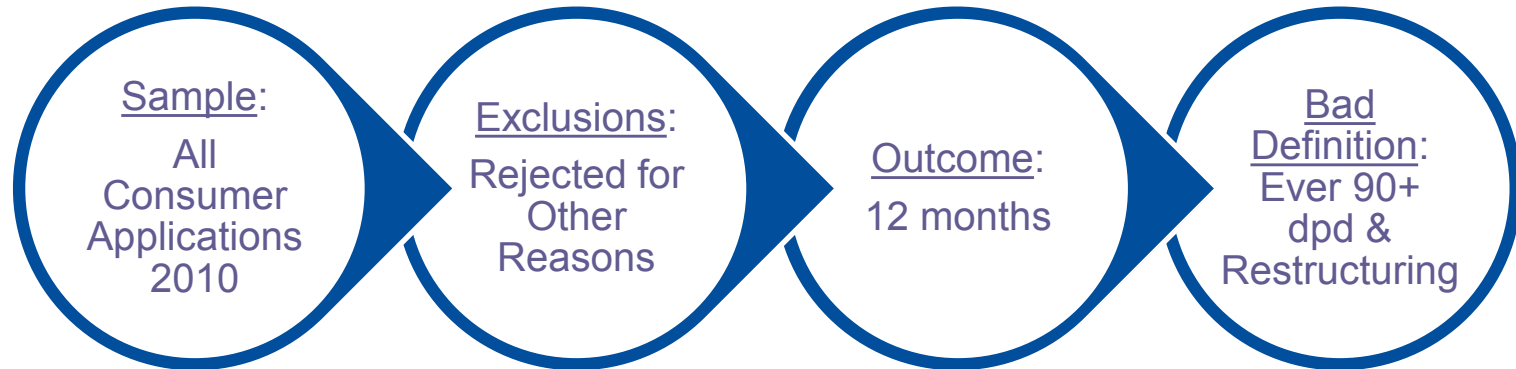


Decision Tree

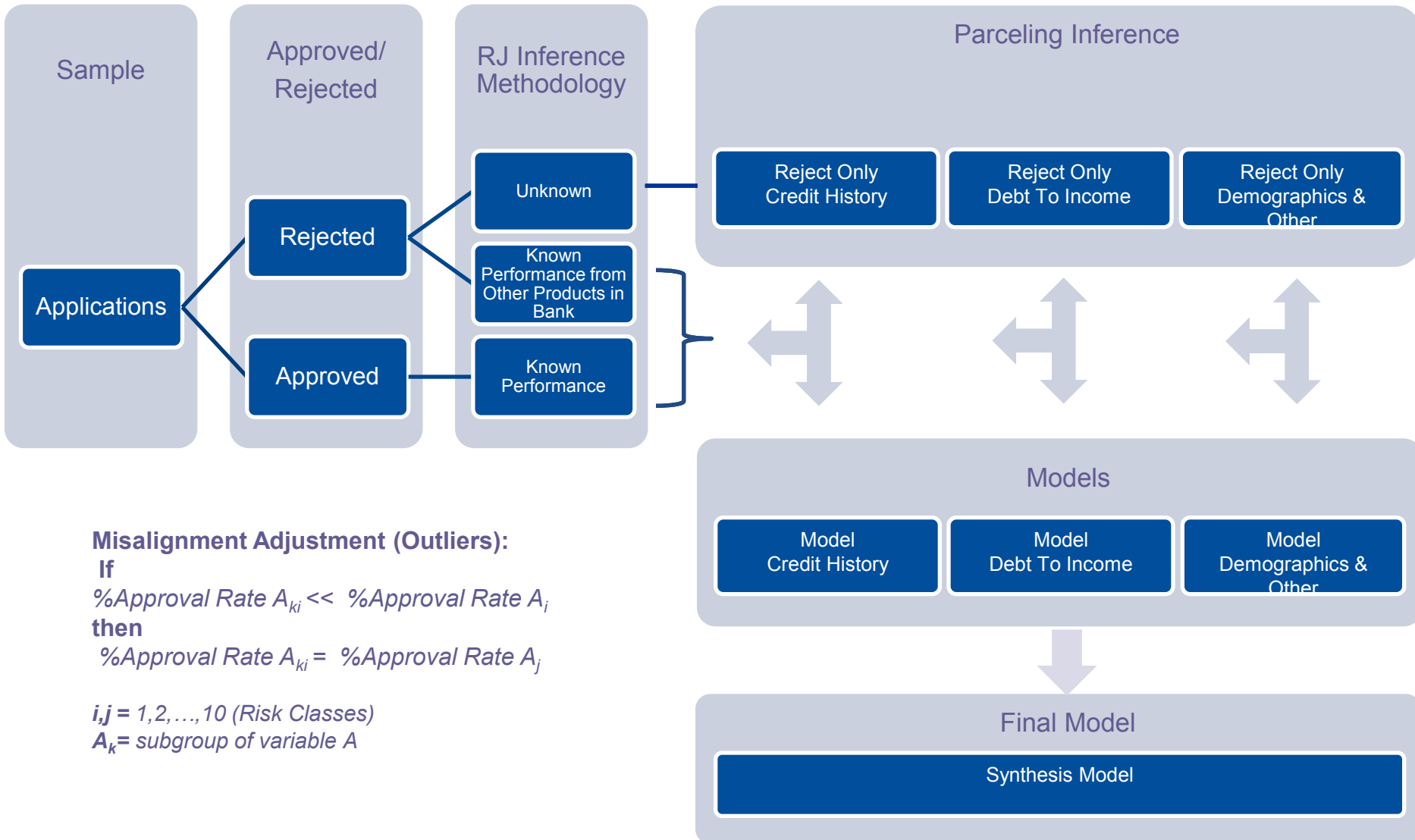
3 Partial Risk Classes ->
1 Final Synthesis



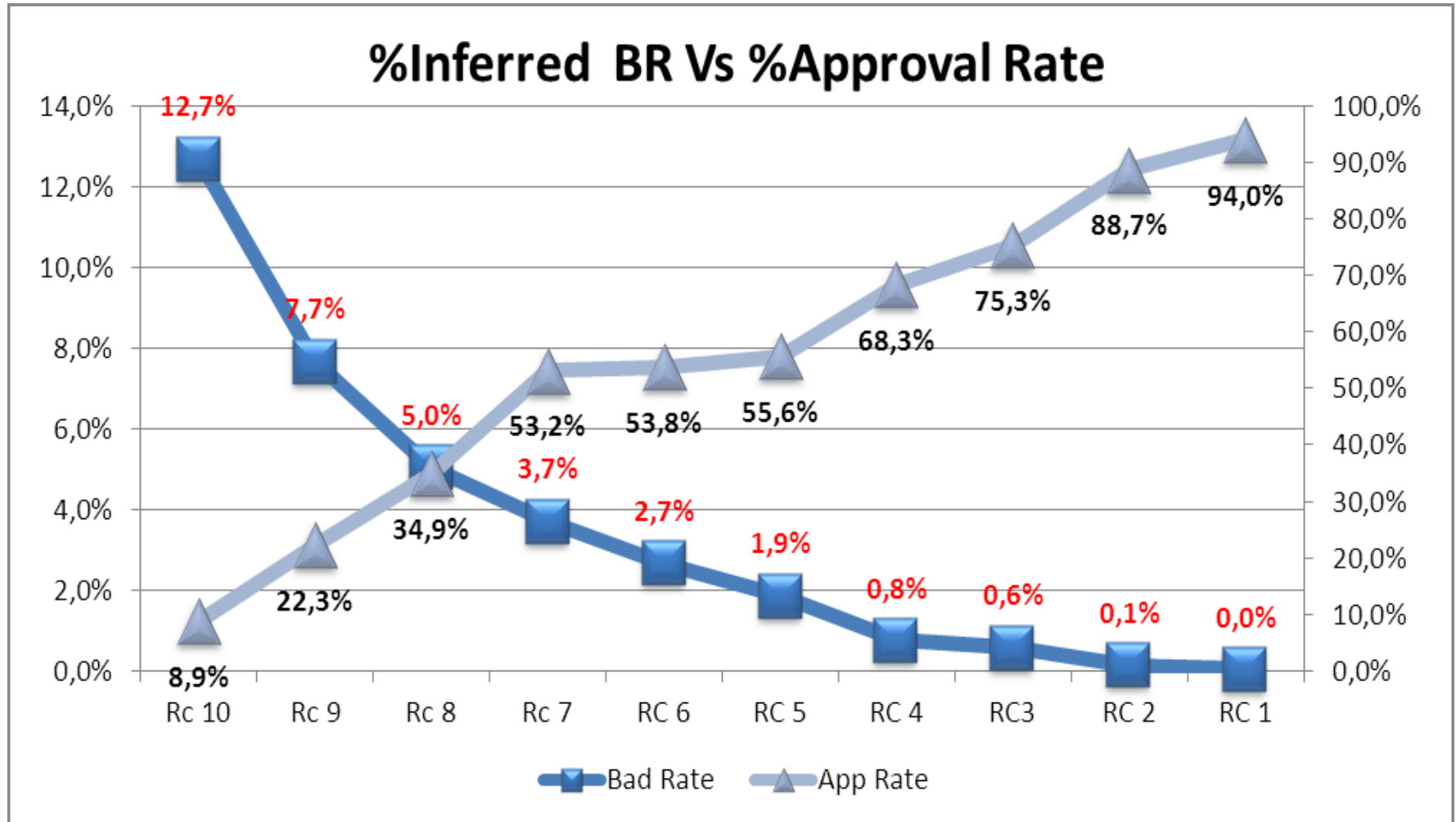
Models Essentials



Reject Inference- Focus

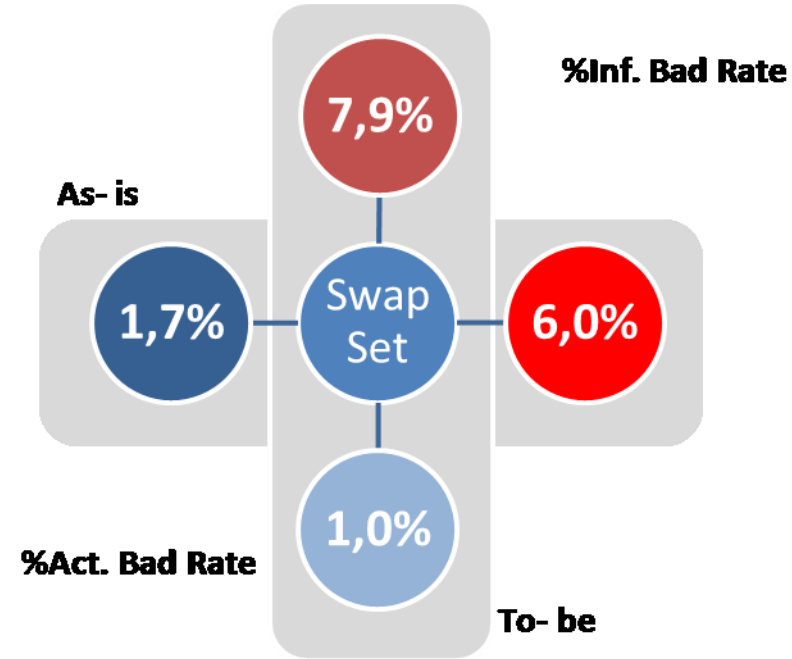
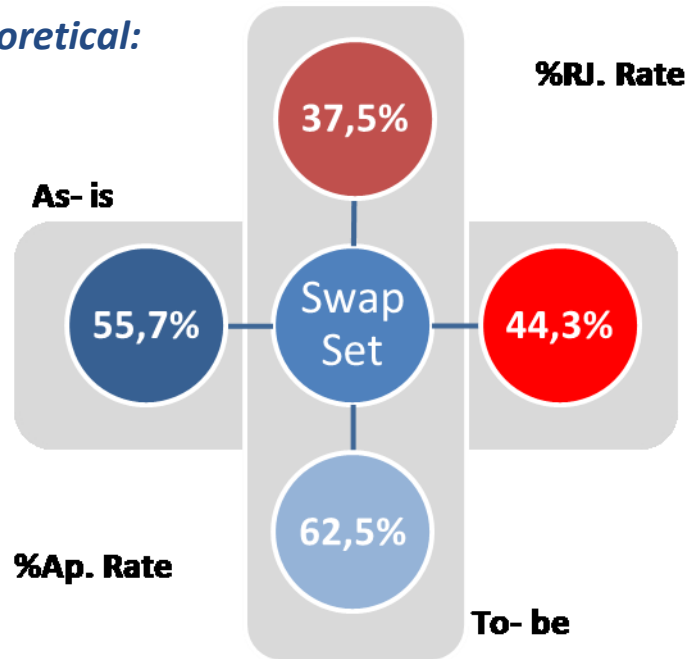


%Inferred Bad & Approval Rate per Risk Class

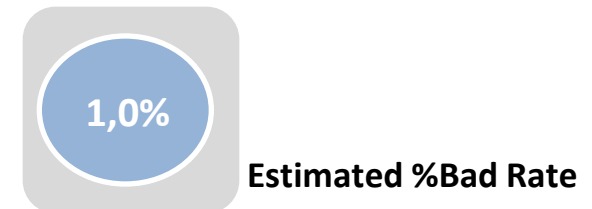
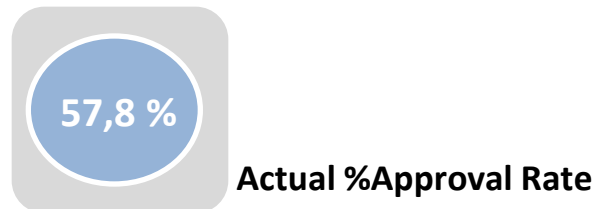


Synthesis Model - Swap Set

Theoretical:

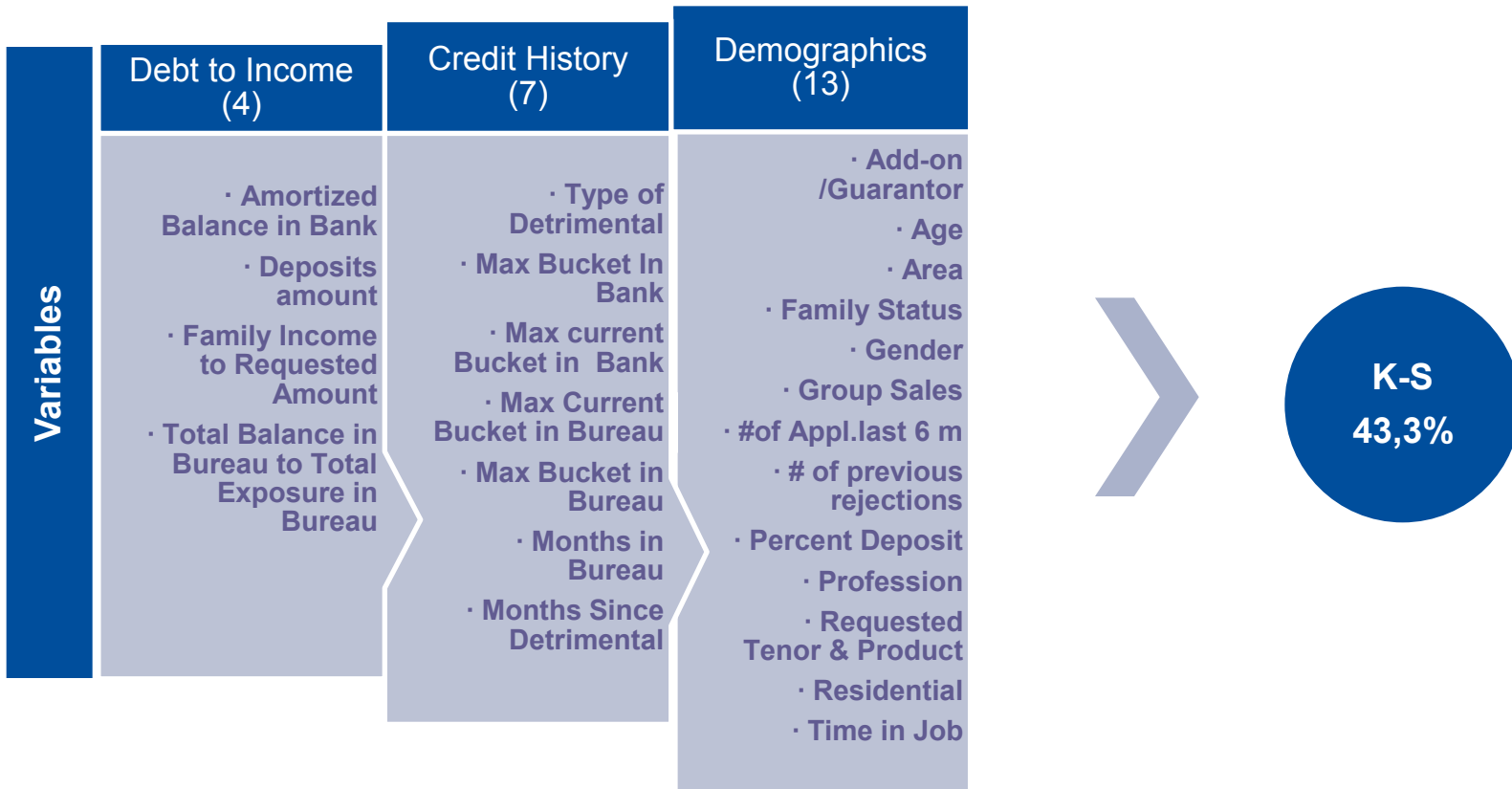


Implementation:



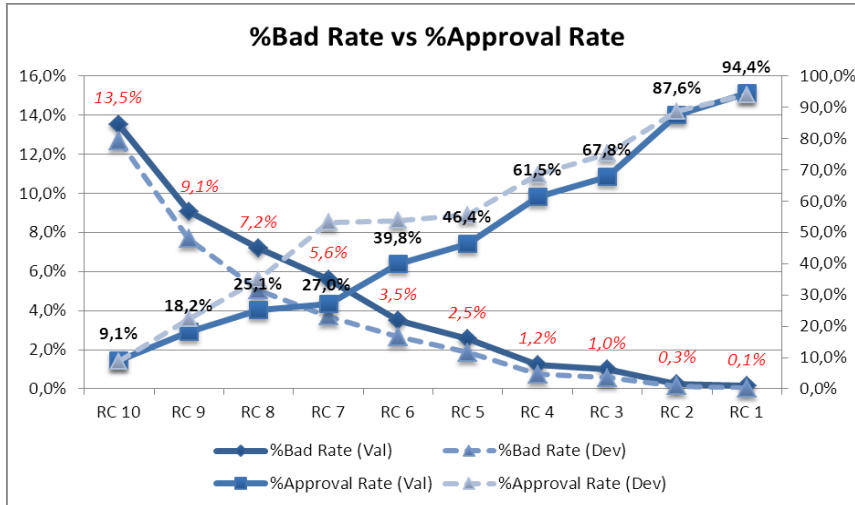
Theoretically, the Synthesis Model should reduce the levels of risk significantly from 1,7% to 1,0% by increasing the %Approval Rate from 55,7% to 62,5%, hence increasing the overall market share of the Bank. However, when these models are applied in production the Actual Approval Rate increases by 2,1%.

Challenger Model



Synthesis Vs. Challenger Model Validation

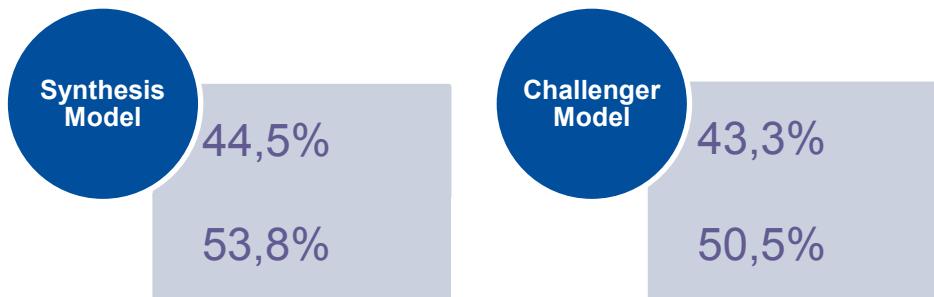
Synthesis Model Validation



Sample Period: 2011 Normal Applications
 Bad Definition: 90+dpd or Restructured @12 months

PSI < 10%
 K-S = 53,8%

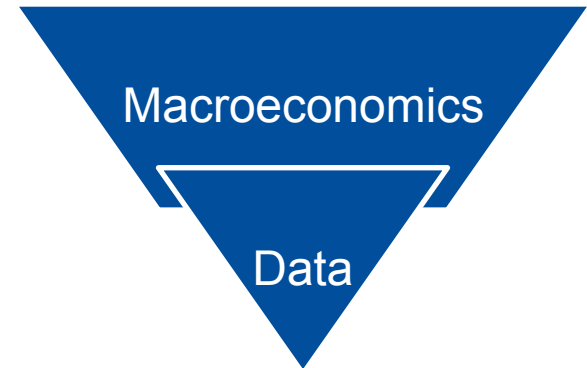
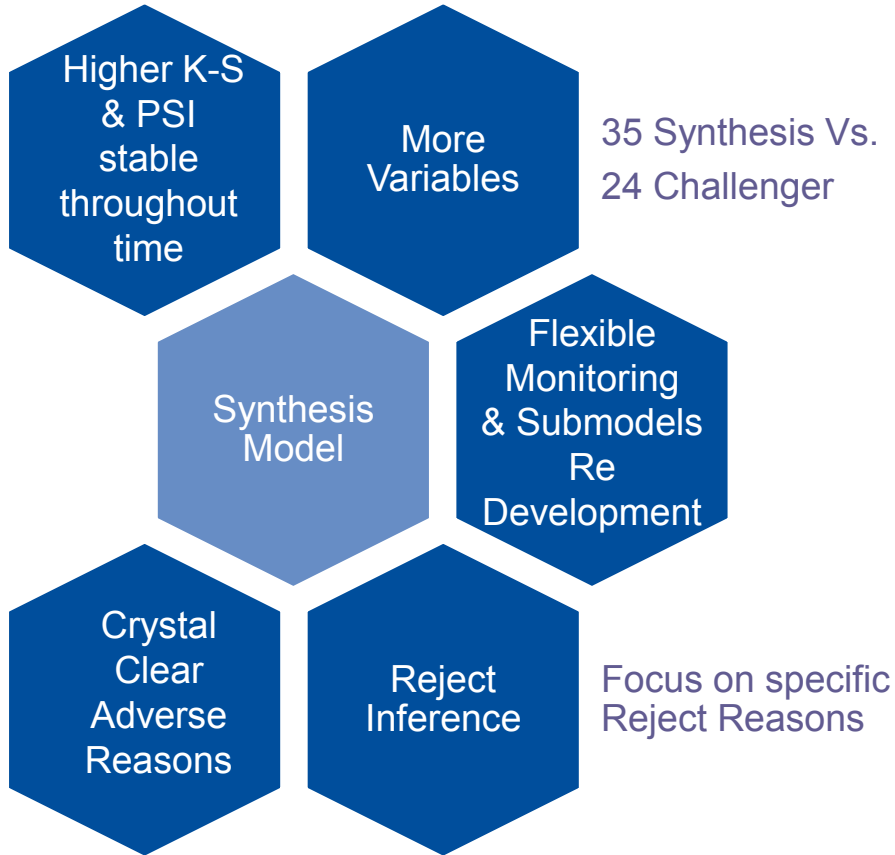
Comparison Synthesis to Challenger Model (K-S)



Development Period

Performance Validation Period

Advantages of the Synthesis



Future Steps of the Models
Inclusion in the
Re Development Process



Future Next Steps

- Different Modeling Approach for the Synthesis Model e.g. Clustering, Regression etc.
- Inclusion of Macroeconomics Data in the Models
- Further investigation regarding the swap set Analysis
e.g. Why do we still have Rejections in the best Risk Class (RC 1) is it due to Regulatory, Policy restrictions?
- Misalignment between two different periods before crisis and after crisis.
 - ✓ Why for the same Risk Class we have diverse Bad Rates?
 - ✓ What factors have contributed to this change throughout time within each Risk Class?

THANK YOU !

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